

IN THE CLAIMS:

Please cancel claims 1 – 116.

Please add the following new claims:

- 1 117. (New) A direct oxidation fuel cell, comprising:
2 a) a membrane electrode assembly including a protonically conductive, elec-
3 tronically non-conductive membrane electrolyte having an anode aspect and an opposing
4 cathode aspect;
5 b) an anodic metallic diffusion layer comprised of a metallic plate having
6 alternating rows of pores therein, a first row of pores including pores of a first diameter
7 for passing liquid reactants and products, and a second row of pores being of a smaller
8 diameter for passing gaseous reactants and products, and alternating said first and second
9 rows of pores throughout the metal plate, such that pore distributions are selected for fa-
10 cilitating anode and cathode reactions by creating discrete and continuous mass transport
11 paths through the diffusion layer for liquid reactants and products, and gaseous reactants
12 and products, selectively;
13 c) a load coupled across the anode and cathode of said fuel cell, providing a
14 path for electrons produced at the anode by electricity generating reactions, to the cath-
15 ode.
- 1 118. (New) The direct oxidation fuel cell as defined in claim 117 wherein the pores of
2 the first diameter are treated with a hydrophilic material to enhance liquid reactants and
3 byproducts to pass to and away from the protonically conductive membrane.
- 1 119. (New) The direct oxidation fuel cell as defined in claim 117 wherein the pores of
2 a smaller diameter are small enough to allow for gas transport but not for liquid transport

3 and said pores are treated with a hydrophobic substance to repel liquids and to allow
4 gases to pass through and to resist water from plugging or saturating the smaller pores.

1 120. (New) A direct oxidation fuel cell, comprising:

2 a) a membrane electrode assembly including a protonically conductive, elec-
3 tronically non-conductive membrane electrolyte having an anode aspect and an opposing
4 cathode aspect;

5 b) an anodic metallic diffusion layer comprising a metal sheet having pores
6 therein placed in a configuration suitable for the diffusion of a fuel mixture to the anode
7 aspect of the protonically conductive membrane; and

8 c) a load coupled across the anode and cathode of said fuel cell, providing a
9 path for electrons produced at the anode by electricity generating reactions, to the cath-
10 ode.

1 121. (New) A direct oxidation fuel cell, comprising:

2 a) a membrane electrode assembly including a protonically conductive, elec-
3 tronically non-conductive membrane electrolyte having an anode aspect and an opposing
4 cathode aspect;

5 b) a cathodic metallic diffusion layer comprised of a metal sheet having
6 pores therein in such a configuration so as to provide for even distribution of ambient
7 oxygen to the cathode aspect of the protonically conductive membrane and for the trans-
8 port of byproducts away from the protonically conductive membrane; and

9 c) a load coupled across the anode and cathode of said fuel cell, providing a
10 path for electrons produced at the anode by electricity generating reactions, to the cath-
11 ode.

1 122. (New) A direct oxidation fuel cell, comprising:

2 a) a membrane electrode assembly including a protonically conductive, elec-
3 tronically non-conductive membrane electrolyte having an anode aspect and an opposing
4 cathode aspect;

- 5 b) a metallic diffusion layer comprising a metal with a rough texture and ex-
6 panded structure which provides an indirect, tortuous path for reactants to flow to the
7 membrane electrolyte and byproducts to flow from the membrane electrolyte; and
8 c) a load coupled across the anode and cathode of said fuel cell, providing a
9 path for electrons produced at the anode by electricity generating reactions, to the cath-
10 ode.

1 123. (New) The direct oxidation fuel cell as defined in claim 122 wherein said metallic
2 diffusion layer is treated with at least one of a hydrophobic and hydrophilic material.

1 124. (New) A direct oxidation fuel cell, comprising:

- 2 a) a membrane electrode assembly including a protonically conductive, elec-
3 tronically non-conductive membrane electrolyte having an anode aspect and an opposing
4 cathode aspect; and
5 b) a metallic layer component fabricated of microscopic particles that have
6 been heated and bonded together such that openings are created wherein the size of said
7 openings is determined by the diameter of the particles, and the diameter is chosen to al-
8 low various reactants to pass through as desired.

1 125. (New) The direct oxidation fuel cell as defined in claim 124 wherein said metallic
2 layer component is treated at least in part with either at least one of a hydrophobic treat-
3 ment or a hydrophilic treatment creating a pattern of hydrophobic areas and/or hydro-
4 philic areas in a desired configuration to facilitate transport of reactants and products to
5 and/or from the protonically conductive membrane.